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ORIGINAL ARTICLES.

ARGYROSIS.*

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A quarter of a century ago the staining of the conjunctiva in diseases of the eyelids was far more common in this locality than it is at the present time, undoubtedly due to two principal causes, the free use of silver nitrate by the charlatans, who gave it to patients indiscriminately, and who themselves employed it in strong solutions, and also to the recommendations in the ophthalmic treatises that solutions of from one to two per cent. were admissible. This last led many regular physicians into the error of continuing its use for long periods in obstinate lid troubles before they discovered that the lids were becoming tinged. In this they wandered from the text-book advice, which usually is that the one and two per cent. solutions should be employed only when the disease is severe and that they should immediately be followed by a weak sodium chloride solution. For nearly all conjunctival affections it is still our best disinfectant; but the revulsion to it because of its indelibly staining quality has unquestionably been salutary, both in the way of substituting other drugs and in leading the text-books to advise for ordinary use 0.25 and 0.5 per cent. solutions when the nitrate is especially desirable, and restricting its employment to the hands of the physician only. This last is especially wise. I once gave a 0.10 per cent. solution to a very intelligent father to be applied once

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daily to the lids of his two sons, aged 8 and 10 years, for a mild follicular catarrhal condition, with instructions to return in four weeks for inspection. As the cases did well the return was made after three months. The drug had been used continuously as directed, the follicular trouble had disappeared, but there was a barely noticeable discoloration of the lower cul de sacs in each of the patients.

There are now many instances on record that the so-called organic silver salts, argyrol and protargol, possess similar staining properties. I have personally observed two cases where, evidently in the attempt to disinfect the lacrimal sac with argyrol or protargol, the syringe point had ruptured the wall of the sac and the solution had invaded the tissues with the result that there was a decided dark discoloration of the upper and lower lids about the inner angle. From one of these I secured histological specimens which will be discussed later on.

As a further evidence of staining from argyrol, my colleague, Dr. M. H. Post, has kindly placed at my disposal an instance which has occurred in his practice, and is another evidence of how lightly the laity honor the confidence extended them by their physicians. In 1905 he prescribed a 10 per cent. argyrol solution for a young lady of more than average intelligence because of an exacerbation of mild follicular catarrh, for which she had been in his care occasionally during the preceding ten years, with instructions to return at short intervals for observation. Compliance with these instructions was delayed for three years; during the interval the argyrol had been resorted to at the pleasure of the patient, and the result was a decided argyrosis of the conjunctival sacs to the nasal side.

That the cornea may also suffer in a similar manner in the case of ulceration is evidenced by two cases now under observation. One is a recurrent perforating ulcer with a trace of a pupil and a very shallow anterior chamber. The original ulcer occurred in childhood; his present age is 28 years. The eye has always given more or less trouble at various times and he has been in the care of many physicians on account of it. When first seen at my office the left eye had been sore for about two months, and, according to his statement, a perforation had existed for two weeks. A moderately nebulous scar occupied the inner portion of the cornea, in the center of which was the perforation, and in the lower curved border of the scar there was marked argyrosis over a space about one millimeter wide and

four millimeters long. Six months later the discoloration persisted, but it had disappeared to the extent that it was scarcely noticeable.

The other instance or instances, for both eyes were here involved, occurred while the patient was in my care. Toward the close of a four weeks siege of illness, supposedly grippe, the eyes became involved. Previous to this in former years, they had often been sore, were always weak and vision had always been poor. At the time of entrance to the hospital the lower two-thirds of each cornea were in a necrotic condition; there was considerable pus in the lower portion of each anterior chamber and vision in each eye was perception of light only. The surface of each ulcer was touched with a saturated solution of salicylic acid in alcohol, which contained also ten grains of resorcin to the ounce; this was followed by a normal saline douche, atropin, and 25 per cent. argyrol. The intense suffering of the week previous was relieved by a fairly good night's rest; the following morning the pus had disappeared from each anterior chamber, probably through perforation; there was a shallow anterior chamber in each eye, moderately dilated pupils, and less conjunctival swelling. As usual, the black argyrol pellicle covered the surfaces of the ulcers. During the succeeding three weeks the twenty-five per cent. argyrol solution was used three times daily following an application of zinc sulphate solution 0.25 per cent. and a physiological salt douche morning and evening. Also a solution of atropin 1 per cent. and cocain 3 per cent. in castor oil was used three times daily. With the slow rebuilding of each cornea in the destroyed area the argyrol pellicle gradually disappeared, revealing stained tissue beneath the newly forming epithelium. When the burning caused by the mild caustic application the first afternoon had passed away the pain practically ceased and, with the three weeks that had now intervened, each cornea was in excellent condition, although the right, by far the worst from the first, was very thin at the center of the ulcer and continued to perforate from time to time. A 1 per cent. potassium iodide solution was substituted for the argyrol. Each eye went on to rapid recovery, but there still remains, now after four months, a more or less dense ring of argyrol stain in the margins of the ulcer in the right eye, the ring being about 0.75 mm. broad. In the left eye only two very small thin spots are present. As this is the best eye practically no damage has resulted; in the right there is a fairly well developed cataract, the patient being 77 years old.

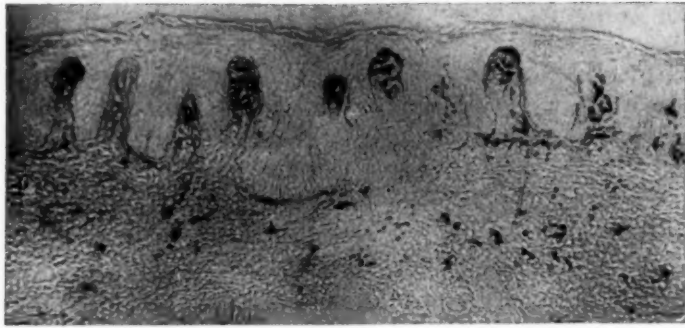


FIG. 1.—Silver pigment in the vascular tract of the papillae and in the adenoid layer of the conjunctiva. Vertical section. Zeiss objective C. Slightly retouched.

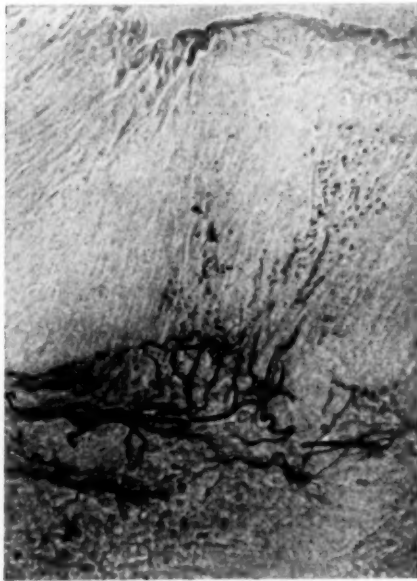


FIG. 2.—Silver pigmented vessels at the base of a papilla in the conjunctiva. Also pigmented elastic fibers. Vertical section. Zeiss objective E. Slightly retouched.

In each of these three instances the discoloration was located in the portion of the ulcers first to heal, the margins, where the capillaries in the rebuilding process appear and change into small bloodvessels. It will be seen in the histological preparations that the elastic fibres of the vessels are particularly susceptible to the silver deposit. This may account for the staining only in this part of the ulcer. However, Knies shows that both Bowman's and Descemet's membranes become more deeply stained by silver than other portions of the cornea, and these silver deposits could occupy the oblique remains of Bowman's membrane, where this membrane had become eroded by the disease.

This is my first experience with staining of the cornea from argyrol, although I have used it in many severe ulcers, and always in ophthalmia neonatorum in connection with a normal saline douche twice or three times daily and frequent cleansing. Its test tube efficiency may be very poor, as has been demonstrated by Marshall and Neave and recently by Pitzman; but, in connection with the natural tendency of tissues to destroy disease, its real efficiency must be very considerable, as was demonstrated by the following instance in which was tried the detergent action and possibly rebuilding effect of the yolk of egg.

The patient, male, 22 years, appeared February 7th, 1905, because of the eyes being irritated, the left having been so for two days. Each was treated with silver nitrate 0.20 per cent. and the left with argyrol 25 per cent.

8th—The treatment was repeated and the left irrigated with physiological salt solution.

9th—Same treatment.

10th—Right eye about well; left eye, suspicious membrane on inflamed conjunctiva.

11th—Smears demonstrated gonococcus and the patient admitted having gonorrhœa. Entered hospital; silver nitrate and argyrol stopped. Ordered constant iced applications, normal saline irrigation every two hours, cleansing of pus from lid margins and yolk of fresh egg to conjunctival sac every half hour.

12th—Conjunctival swelling increased; slight coagulation of conjunctival discharge with each irrigation, which entirely disappeared after the egg yolk application; smears showed individual cells being destroyed by the gonococci and also the gonococci free in the secretion.

13th—Swelling of the lids a little less marked; less secretion; the gonococci abundant in the smears; a fold of conjunctiva from above covered the upper corneal margin.

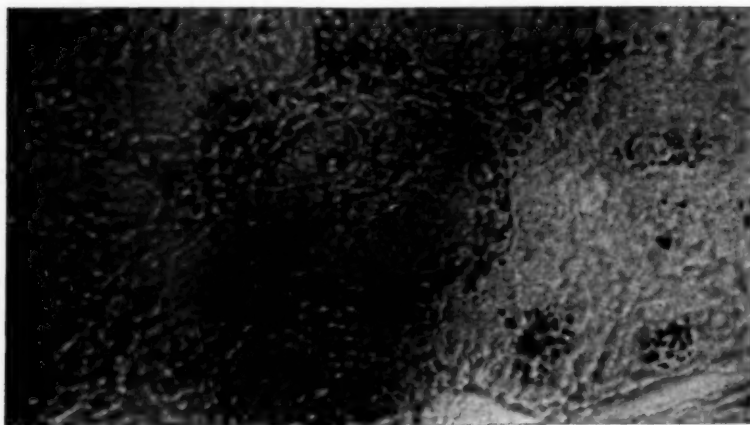


FIG. 3.—Silver deposits in the vascular tract at the base of a conjunctival papilla. Horizontal section. Zeiss objective E. Slightly retouched.

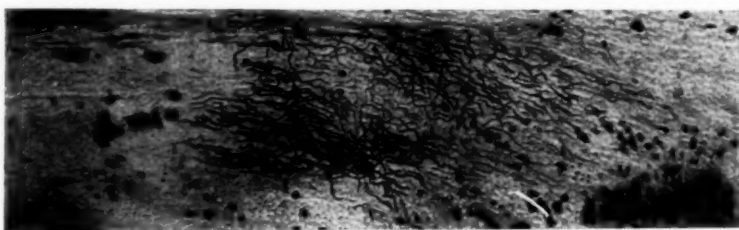


FIG. 4.—Elastic fibers and silver deposits in the adenoid layer of the conjunctiva. Horizontal section. Zeiss objective C. Slightly retouched.

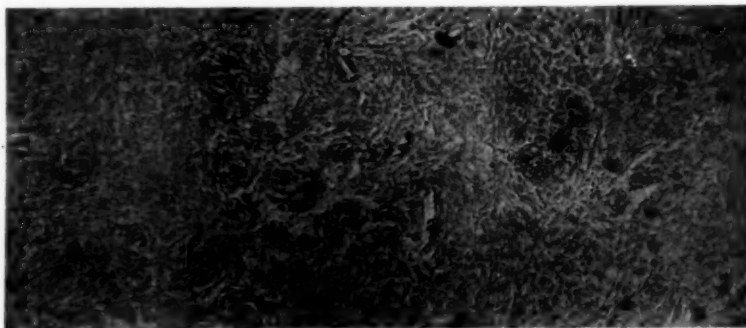


FIG. 5.—Silver deposits in the interior of the tumor mass of the carcinomatous growth of the orbit. Zeiss objective C. Slightly retouched.

14th, 9 a.m.—“Eye does not feel so full and queer as four days ago”; conjunctiva clean, corneal epithelium a little hazy; less circum-corneal injection. 6 p.m.—Considerable pain during the afternoon; smears showed great increase in gonococci. Inquiry developed that the day nurse in attendance the last two days had opened the lids in applying the egg yolk only sufficiently to expose the cornea. The night nurse had lifted the lid and applied it efficiently. The two-hour saline cleansing has been performed by the house surgeon.

15th, 9 a.m.—Swelling less marked in lids and about the cornea; lids could be everted much more easily than at any time during the last five days; about upper corneal margin minute conjunctival elevations had appeared, each elevation being covered at its summit with the typical dirty grayish membrane characteristic of this disease; no disturbance in the corneal epithelium, which was yesterday a little clouded. 6 p.m.—The croupous membrane had ceased to form; eyes also much more comfortable; gonococci abundant in the smears.

Although the general swelling was subsiding two suspicious facts were present which indicated that the eye was still in great danger. These were the continued presence of the gonococci in great numbers and the breaking down of the epithelium at the corneal margin. For this reason a 25 per cent. argyrol solution was added to the treatment outlined above to be used after each two-hour irrigation. Also the iced applications caused pain and these were ordered to be made only when the eye felt irritated.

16th—Swelling somewhat increased about the upper corneal margin; small ulcer at margin beneath the overhanging fold of conjunctiva; no decrease in the general swelling. Smears demonstrated a great decrease in the number of gonococci.

17th—Conjunctiva much cleaner; very little discharge; no increase in size of corneal ulcers. Smears showed only an occasional gonococcus present.

18th—As yesterday, except that the smears contained no gonococci, a practical and positive demonstration of the efficiency of the drug.

From this time on the eye continued to improve rapidly. Four months later the patient returned because of having a foreign body in the eye. There was no evidence of conjunctival or corneal staining from the previous free employment of the argyrol.

A few months later a similar experience occurred in the case

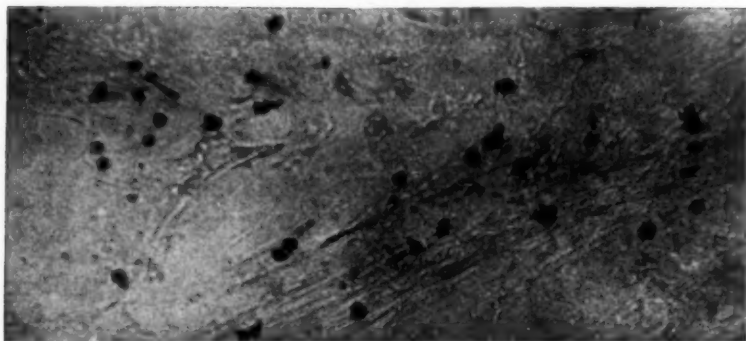


FIG. 6.—Silver deposits in the loose connective tissue of the carcinoma. Zeiss objective C. Not retouched.

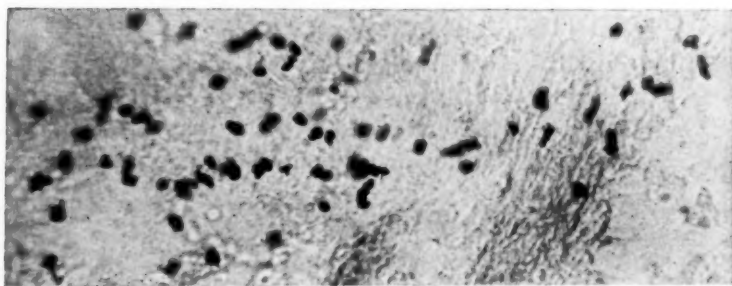


FIG. 7.—Silver deposits in the more dense connective tissue of the carcinoma. Zeiss objective C. Not retouched.

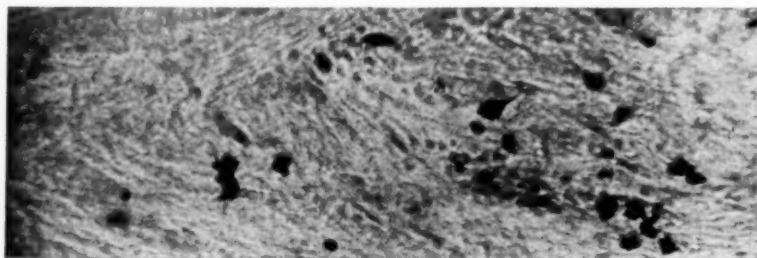


FIG. 8.—Silver deposits in the dense connective tissue of the carcinoma. Zeiss objective E. Not retouched.

of an already necrotic cornea at the first consultation. Essentially the same line of treatment was pursued until the smears no longer contained the gonococcus. With the hope of rebuilding the cornea through nourishment from the conjunctiva, the conjunctival surface of the upper lid was lightly scarified and the eye bandaged for two days. On opening the eye the gonococcus was again found to present in the discharge. With a return to the argyrol it wholly and permanently disappeared during the ensuing twenty-four hours. Although the argyrol was employed here for weeks the renewed cornea showed no staining and none had developed a year later.

Corneal staining as a result of applying silver nitrate has never come under my observation, although formerly I have frequently employed it myself on a pledget of cotton directly to corneal ulcers in solutions of from 1 per cent. to 5 per cent., and I have also observed its employment in similar manner by my colleagues, Dr. Green and Dr. Post, and many of their cases as well as my own I have seen months and years after the recovery and have observed the scars carefully. As such applications are usually made only once or twice for the immediate destruction of infection, staining is not likely to occur.

My experience with protargol has been very limited. In the cases in which I have employed it, its irritating properties seemed to be so much greater than in the case of argyrol or silver nitrate, without any gain in efficiency over either of these, that I have preferred the latter. Staining properties unquestionably exist in all of them, as evidenced by many reports from most careful and experienced ophthalmologists. For this reason the greatest care and watchfulness should be exercised in their employment.

Although the argyrosis which ordinarily comes to the notice of the oculist is local, and has been caused by application of silver in some form to the conjunctiva, the conjunctival argyrosis may also be a part of general systemic argyria, as was not infrequently observed formerly when silver nitrate was employed as a remedy for epilepsy and for locomotor ataxia. Long continued local application to the throat has caused argyrosis of the face, neck and conjunctiva, and the conjunctival discoloration has been observed when the nitrate had been employed for twenty-five or thirty years on the scalp to color the hair (Lewin and Guillery, *Arzneimittel u. Gifte*, Vol II, p. 805, 1905). It occurs among the makers of glass pearls where silver is used as a coloring agent, and among those who are employed in the

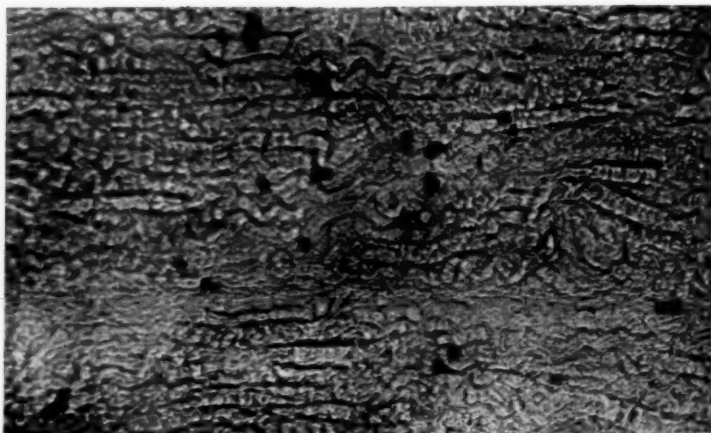


FIG. 9.—Silver deposits in striated muscle adjoining the carcinoma. Zeiss objective C. Slightly retouched.

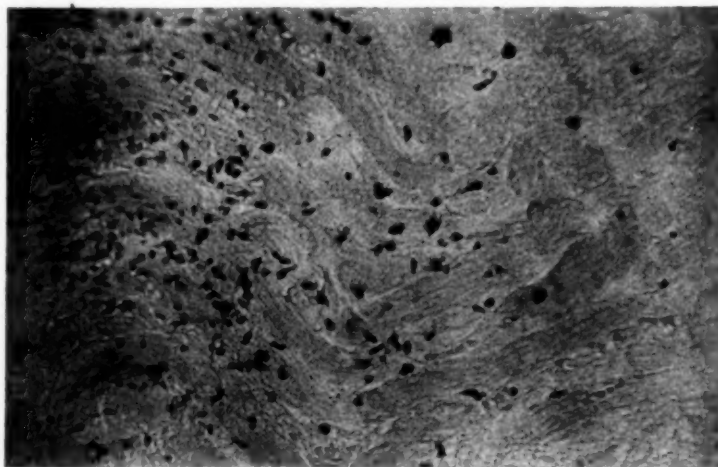


FIG. 10.—Fine silver deposits in the muscle bundles in muscle tissue adjoining the carcinoma. Zeiss objective E. Slightly retouched.

manufacturing of dry plates for photographic purposes. Recently an instance of the last named type has been observed by my colleague, Dr. Shahan.

Argyrosis of the conjunctiva was first histologically investigated by Junge in 1857 (*Graefe's Archiv.* Bd. V. Abth. 2, S. 197) in small pieces of the membrane taken from the temporal sides of the globes three to four lines from the corneal margins, the subject being a day laborer who had used a one-half grain to the ounce of silver nitrate solution in the eyes for several months. In both the oblique and the cross-sections from these specimens of the membrane he found that the cause of the discoloration existed in the epithelial and superficial connective tissue layers and in the deeper elastic fibers, in the connective tissue assuming partly the form of groups of immeasurably fine black precipitate, taken to be silver oxide, and partly scattered here and there, cherry brown granules, taken to be silver albuminate, while in the epithelial layer there was only a yellowish gray tint as seen by transmitted light. The deposits were particularly noticeable in the elastic fibers of the connective tissue layer, in which they formed a dark brown net work that extended into the deeper structure of the corium.

In 1875 Riemer (Lewin and Guillery, *Arzneimittel u. Gifte*, Vol. II, p. 806) reported an examination of general argyria, histological, in a patient who had died suffering with tabes. During the year preceding his death he had taken internally about 500 grains of silver nitrate. The examination of the eyes was made by Kuster, who found a fine granular silver deposit in the sclera, optic nerve sheath, basal membrane of the conjunctiva, subconjunctival tissues, Tenon's capsule, tendons and interstitial tissue of the muscles and the ciliary vessels, the tissues richest in bloodvessels being the ones that were involved to the greatest extent. The optic nerve, the retina, the cornea, the lens, the zonule of Zinn, the vitreous and the ciliary nerve were exceptions, no pigment being present in them.

In 1880 Knies made a histological examination (*Klin. Monatsblätter f. Augenheilkunde*, 1880, Mai, S. 165) of the eyes (globes only) secured in post mortem from a subject seventy-two years old who, according to the history for forty or fifty years had penciled his eyes every second or third day with stick silver nitrate because of an inflammation which had originated with measles. In places where there was no epithelium the conjunctiva appeared intensely bluish black, and gray where the epi-

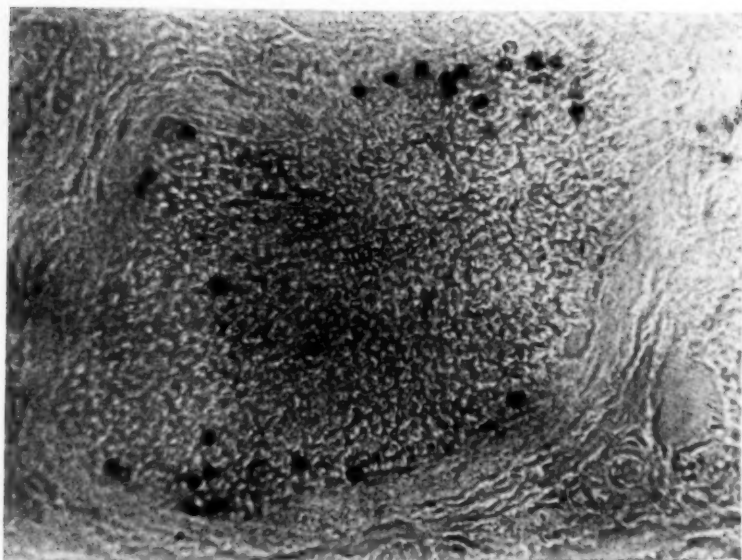


FIG. 11.—Pigmented white blood cells in blood stream. Silver pigment (?) Zeiss objective E. Slightly retouched.

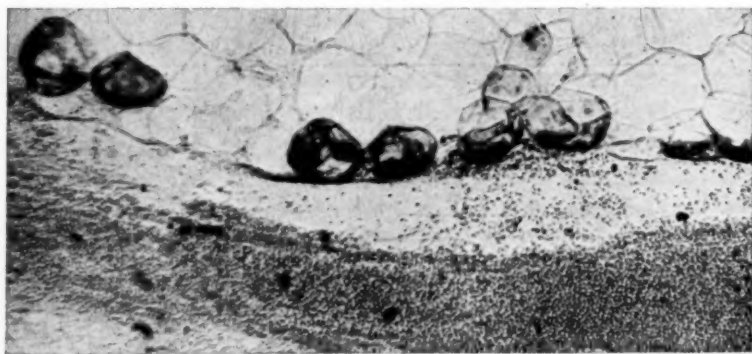


FIG. 12.—Silver pigmented fat cells adjoining the carcinoma. Silver deposits in the hemorrhage. Zeiss objective C. Not retouched.

thelium was present. The cornea was stained dark brown over its whole central portion, less so toward its margins, and not at all for a space of two millimeters at the margin where it was covered by conjunctiva; its epithelium was grayish. In the ciliary region, when the conjunctiva was inspected from its posterior surface by lifting it from the globe the bloodvessels on its under surface and those passing into the corneal margin were observed to be blackened, giving the picture of black branching threads. The superficial layers of the sclera were bluish black as far backward as the equator where their color again became wholly normal; also the outer surfaces of the tendons of the recti muscles were deeply stained as far as where they had been divided, which was very close to their bulbar insertion.

The sections showed no staining and no silver deposits in any of the tissues posterior to the equator. Anterior to the equator the discoloration assumed two forms, brownish for the cornea, bluish-black for the other tissues, both of which disappeared on treatment with strong nitric acid or with a solution of potassium iodide.

The cornea, particularly the anterior and the posterior limiting membranes (Bowman's and Descemet's membranes), was deeply stained in places except the endothelium and the epithelium, both of which were wholly free from discoloration. Also the epithelium of the conjunctiva was unstained, but the lymph-vessels of the basal structure were loaded with the silver deposits, and similar deposits were distributed here and there in the connective tissue and markedly in the adventitia of the bloodvessels. Sections from the outer surface of the sclera and the outer surfaces of the recti muscles showed the lymph spaces in these tissues filled with the fine granular silver deposit, as well as the outer and inner surfaces of Tenon's capsule.

A fourth histological examination of the conjunctiva because of argyrosis was reported by Grossmann in 1888 (*Ophthalmic Review*, Vol. VII. No. 80, June). He cut small pieces from a conjunctiva on which strong silver nitrate solution had been used for six months and examined them by teasing and by fixing and cutting into sections. Aside from isolated solitary grains of deep black pigment in some places, he found only the elastic fibers were involved, being stained a deep brownish-black and to the extent that the older ones would break up into a fine granular detritus which resembled chains of bacteria. His findings he illustrates by two good drawings.

In 1899 Hoppe made a histological examination of the conjunctiva (*Graefe's Archiv.* Bd. XLVIII. Abth. 3, S. 660) by means of small pieces taken from the globe and from the lid. The patient, a female 51 years old, had dropped into the eyes a 0.25 per cent. silver nitrate solution for six years because of phlyctenular keratitis, holding the head backward and letting the drop fall into the lower cul-de-sac. The lower half of the conjunctiva, the puncta, the base of the caruncle and the cornea in each eye were deeply stained, but not the retrotarsal folds of the upper lid, or the dermal surface of the lids or the lid margins. There was no discoloration of the nasal mucous membrane and no metastatic discoloration.

The staining of the conjunctival sac only in portions by using drops in the manner carried out by this patient, Hoppe points out as being of clinical importance in the use of medicines for

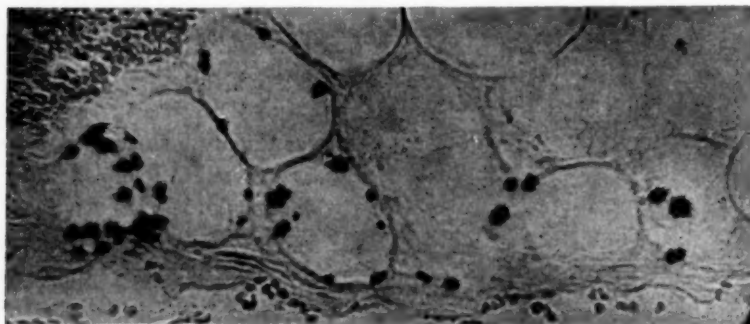


FIG 13.—Silver pigmented crystals in the fat cells adjoining the carcinoma. Zeiss objective E. Slightly retouched.

conjunctival diseases, the evidence from the location of the stain being that very little, if any, of the disinfectant reached the retrotarsal folds of the upper lids.

As to the location and manner in which the silver deposits are distributed in the tissues his findings were the same as those of the investigators who preceded him, except that there was no involvement of the adventitia of the bloodvessels, the deposit having located itself on this tissue and not within it. The individual tissues especially involved were the elastic fibers of the vessels and those in the sub-epithelial basal network of the conjunctiva; the lymph spaces and vessels were rich in the pigment. Also he found that when bloodvessels or elastic fibers had become fully incrustated there was no further heaping up of the incrustation,

the silver deposit seeking other fibers or vessels for location or remaining loose in the meshes of the tissues. Distribution of the pigment by means of leucocytes was not sufficiently apparent to be taken into account; he did not find a single white blood cell involved.

He mentions the two principal theories for the explanation of argyrosis, that of Kramer-Frommann, who hold that the silver is dissolved in the intestine, is then absorbed and taken up by the bloodvessels, by which it is carried, and through their walls passes into the lymph-stream to the tissues where it is reduced to the form in which it is found; and that of Riemer-Virchow that the silver nitrate is reduced immediately in the digestive tract to finely divided silver particles which are caught up by the lymph stream and carried by it to its places of deposit in the tissues. In the last theory it is always a finely divided foreign body and finds lodgment mainly in the elastic tissue, this being the filtering agent for the protection of the other tissues. The article is well illustrated.

An examination histologically of the lacrimal sac caused by applications of protargol was made by De Schweinitz in 1903 (*Trans. Am. Ophth. Soc.*, 1903, Vol. X. Part 1, p. 161) who illustrated his results with a beautiful colored plate. The protargol had been employed at home by the patient for about a year and had caused deep staining of the bulbar and palpebral conjunctiva, the retrotarsal folds being almost a chocolate color and the bulbar conjunctiva a yellowish brown. The caruncle was deeply colored and also the slit canaliculus, but the lid margins were not involved. Because of marked suppuration the lacrimal sac was excised and hardened in formalin. In the sections he found the pigment around the elastic fibers, outlining the inner wall of the capillaries, and possibly, free granules in the meshwork of the tissues, although he thought that many of these granules might be regarded as cross-sections of incrustated fibrils. The incrustation extended three-fourths of a millimeter below the basement membrane and outlined clearly the meshwork of the tissues. In the discussion of the article before the Society, Fridenberg stated that he had found similar deposits in the lens, but that the epithelium of the lens was not involved.

In an article upon pigment patches in the conjunctiva (*Les Taches Pigmentaires de la Conjunctive, Annales d'Oculistique* June, 1906), in which he discusses the varieties of these patches, Steiner mentioned having examined specimens of the conjunc-

tiva in which the staining had been produced by instillations of silver nitrate. He found the pictures presented by these sections to be wholly different from those containing organic pigment, the silver pigment being in the form of large irregular black masses, sometimes pointed, giving the impression of foreign bodies. It was external to the cells and bore no intimate relationship to the tissue elements.

Gabrielédès has recently (*Archives d'Ophthalmologie*, December, 1911) made histo-chemical analyses of the argyrosis of the skin and conjunctiva, employing for his subject matter in the investigation of the conjunctiva a piece taken from the lower cul-de-sac of a female who had suffered with granular lids for twenty years for which she had been treated with silver nitrate and protargol, and for his investigation of the skin, sections from a bit of skin taken from just above the mammary gland in a man of 49 years, who had been employed in the manufacturing of photographic paper and plates for 22 years, as well as in their development. In his work he often licked the silvered surfaces. After five years he began to notice a bluish discoloration of the skin, nevertheless he continued his occupation until five years previous to his entering the hospital for melancholia when the above mentioned specimens were obtained. As a control in the examination the pigmented regions in sections from the eye of a fœtus were employed. His findings were as follows:

(1) With a 5 per cent. potassium cyanide solution the silver disappeared from the argyrosis sections in 30 minutes, the physiological pigment in the fœtus sections was present at the end of 4 hours.

(2) With pure tincture of iodine, 30 minutes, followed by a 5 per cent. potassium iodide solution for 30 minutes the same results were obtained.

(3) With pure nitric acid the silver disappeared in 60 minutes.

(4) With euehlorin (KClO gr. 1, HCl gr. 3, H₂O gr. 150) the silver disappeared in 2 hours; the physiological pigment blanched in the same length of time.

(5) With a saturated solution of sodium phosphate both pigments were unchanged.

(6) The same results were obtained with a saturated solution of sodium hyposulfite.

(7) With a saturated solution of potassium permanganate the silver was unchanged, the physiological pigment disappeared.

His histological researches he accompanies with three excel-

lent plates, two from the skin, one showing the distribution of the silver deposit in a papilla and another showing its distribution in the sweat glands, the muscles and the vessels, and the third from the conjunctiva showing the epithelial, adenoid and fibrous layers with the pigment throughout the two latter but not in the former. His conclusions with regard to the involvement of the elastic fibers, the bloodvessels and lymph channels coincide with what has heretofore been mentioned.

Personally, two opportunities for the examination of argyrosis in immediate fresh tissues have presented themselves, one in sections taken from the orbital region which had been discolored in the attempt to treat the lacrimal passage, the other in sections from the conjunctiva and sub-conjunctival tissues. For the specimen in the last mentioned case I am indebted to my colleague, Dr. M. H. Post, by whom the conjunctival sac, tarsal cartilages and cilia had been excised because of a stubbornly discharging socket with painfully spastic lids, which, during two years could not be relieved by any mode of treatment. Three years previous to this a staphylomatous tender globe had been removed. The discoloration involved the whole conjunctival sac but was much more marked in the lower lid and the lower retro-tarsal region. The specimen was preserved in formol, 5 per cent. solution, passed through alcohol, mounted in celloidin and the sections stained variously with eosin, eosin-hematoxylin, Van Gieson, safranin, alum carmin, picric acid, and alum carmin and picric acid. Other sections were examined without being stained. It was from these that the accompanying diagrams were photographed, as any stain will more or less obscure the silver deposit. In the manipulation with stains it was found that the Van Gieson method removed the silver. This also happened when hydrochloric acid was employed as a clearing agent for hematoxylin. The deposit was best observed in the unstained sections or in sections slightly tinged with picric acid or with eosin. When nuclear staining was desirable, alum carmin served best.

The epithelium proper was lacking in the pigment, but the vessels and lymph spaces of the papillæ were richly loaded with it as is seen in Fig. 1. The bloodvessels entering the papillæ in some places were wholly blackened, Fig. 2, and numerous irregular deposits were located in the vascular channels surrounding the bases of the papillæ, Fig. 3. Brownish or black granules discrete or in irregular masses of various sizes were distributed throughout the adenoid layer mingled with brown or blackened

elastic fibers, Fig. 4. Here and there in the Meibomian glands and in the muscles and fat of the lower lid the pigment was evident, less so in the upper lid, an indication that gravity had played a role in its distribution. In the blood stream of many of the vessels there were round black bodies resembling white blood cells loaded with the pigment, and as this pigment blanched when the sections were treated with tincture of iodine and potassium iodide the silver carrying property of these cells seemed to be established; but with the further test of potassium permanganate and oxalic acid the cells became clear, while the silver deposit in the papillae and in the basal membrane remained unchanged, demonstrating that the cells were probably colored with an organic pigment.

The case in which the orbital tissues were involved had suffered for two years with a carcinoma at the inner angle of the left eye, which involved the lacrimal sac, and because of this had evidently been taken for a lacrimal abscess, the story being, that eight months previous a probe was passed and an injection was made with a syringe, following which the eyelids became discolored. A moderate argyrosis existed in the lower lid and about the growth, but there was no involvement of the globe or of the conjunctiva. It bore all the marks of a discoloration caused by the subcutaneous injection of argyrol. Several such instances have come under my observation in which the argyrol was used for the treatment of the lacrimal sac, and the syringe point had ruptured the wall of the sac. The same accident has happened to me personally, when employing nitrate of silver in a 0.25 per cent. solution for the same purpose, but there was no discoloration afterward, while in these cases caused by argyrol it was said the discoloration resulted from a single injection. It has been suggested to me by Dr. Leo Loeb that the explanation for this difference in the behavior of the two silver solutions when employed subcutaneously is, that the argyrol, being a colloid form of silver, is much less readily absorbed.

In the succeeding eighteen months which were required for the patient to win his consent to the loss of the eye, there was some decrease in the discoloration, but it was still very noticeable when the carcinoma was excised. This excision included the lids, inner angle and globe, and the whole mass was immediately preserved in a 5 per cent. formol solution.

Sections through the discolored region in the neighborhood of the growth, and through the growth itself, showed large and

small irregular pigment deposits here and there throughout the connective tissue framework of the carcinoma, at its center as well as near the margins, Figs. 5, 6, 7 and 8. In the adjacent normal muscle tissue the deposits were very abundant, Fig. 9, the high power showing the fine black particles among the fibrils within the muscle bundles, Fig. 10.

The peculiarity of the white blood corpuscles being deeply pigmented in some of the bloodvessels and not in others existed in these sections, Fig. 11, the same as in those from the conjunctiva; but in these the pigment blanched but did not clear with the permanganate and oxalic acid clearing agent, and blanched equally as well or better with tinct. of iodine and potassium iodide, an indication that the white blood cells take part in the transporting of the silver to different portions of the system. The permanganate alone did not remove the pigment from the cells in either of the cases. It came away with the clearing in oxalic acid. This led to the experiment of staining a section deeply with silver nitrate and destaining with oxalic acid solution of the same strength as that previously employed. Nearly all the silver disappeared in the oxalic acid. Trial with sections from the orbit showed that in these it also blanched the silver deposits.

Of particular interest were many fat cells which were discolored brownish or black, Fig. 12; and in some of these cells there were numerous fatty acid-like agglomerated crystals, Fig. 13, which were black or brown by artificial light and black by daylight. In the discolored cells not containing the agglomerated crystals the cell substance was made up of fine granules or short acicular crystals when examined with a high power. The stain in both the cells and the crystals persisted after treatment with potassium permanganate and oxalic acid, but blanched when treated with tincture of iodine and potassium iodide, a strong indication that the crystals were crystals of the stearate of silver.

When applied to for the interpretation of these crystals, Professor Shaffer, of Washington University, demonstrated that a 5 per cent. silver nitrate solution added to an alcoholic solution of stearic acid produced crystals similar in form and in color. These artificial crystals were also insoluble in ether, and on standing and becoming dry they proved to be insoluble in hot or cold water, or in alcohol.

The existence of the crystals in the fat cell and attached to the walls of the cell envelope is positive indication that the sil-

ver invaded the fat cell in some form. From the account of the treatment as related by the patient, the silver was forced into the tissues and rupture of these cells may have occurred. The location of the more deeply pigmented cells at the border of septa which bore bloodvessels is in support of this interpretation. On the other hand, however, this proximity to vessels would also be necessary to the natural absorption of the silver, and in addition to this many of the stained cells are deep with the mass of fat. Moreover, metastasis exists, for the black particles are found in the corium and the hair follicles of the adjoining skin.

The problem of how the silver is absorbed by the fluids of the body, and why it is deposited in this manner peculiar to itself, still remains unsolved; but the crystals in the fat cells indicate that the stearate of silver may become insoluble in the body fluids. This together with the action of the white blood corpuscles may be links in the chain of evidence necessary to the explanation of the enigma.

ON A CASE OF ARGYROSIS OF THE CONJUNCTIVA
AND THE STAINING OF THE EPITHELIUM
FROM THE APPLICATION OF AN
ARGYROL SOLUTION.

BY ADOLF ALT, M.D.,

ST. LOUIS, MO.

Having by the kindness of Dr. A. E. Ewing been permitted to study with him the specimens of argyrosis which form the basis for the preceding paper, I was particularly anxious to make, myself, some further examinations of such a case. This opportunity offered sooner than I had expected.

The history of this case was interesting in itself. About three years ago I was called to see a patient in consultation with a general practitioner who had had this patient under treatment for something over three months on account of gonorrhoeic conjunctivitis in both eyes. I found that the treatment had consisted in the rather promiscuous use of a 2 per cent. solution of silver nitrate, a 20 per cent. solution of argyrol, a boric acid solution, and ice applications. All of these solutions had been

instilled every few hours into the conjunctival sac of both eyes, night and day.

When I saw the patient, who was extremely weak and worn out, the left eye was blind with a large corneal staphyloma; the right eye had a small marginal ulcer at the lower periphery of the cornea. There was still a considerable quantity of conjunctival discharge, but this was absolutely steril.

The whole conjunctiva was of a dirty brown color which was darker in the lower lids and at the base of the caruncles, and darkest in the conjunctiva of the right lower lid.

I suggested at once that the treatment be reduced to the use of the boric acid solution. This was done, and in a short time the discharge and the patient's local complaints had disappeared.

The argyrosis, of course, remained unchanged, but gave the patient no cause for complaint, as I found, since I had occasion to see him repeatedly during these three years, when examining his refraction.

A few weeks ago he turned up at my clinic at the St. Louis Mullanphy Hospital on account of a small hordeolum on the right upper eyelid. My opportunity had come. I applied a more than usually large quantity of a 25 per cent. argyrol solution to his conjunctival sac and ordered him to come to my office for the removal of a small piece of conjunctiva, to which he willingly consented. The next morning he came and I removed from the middle of the lower retrotarsal fold a piece of conjunctiva about 5 mllm. square, which was at once put into a 5 per cent. solution of formol and afterwards hardened in alkohol. Although the patient's conjunctiva appeared dark brown, the excised piece had but a yellowish brown color. The microscopical sections were mostly left unstained, a few were lightly stained with fuchsin and some with hæmatoxylin.

The examination of these sections revealed nothing new, as regards the older silver deposits. It simply confirmed what had been found by the previously published examinations.

There was, however, one exception. Among the previous observers none had found any silver in the conjunctival epithelium. Junge alone spoke of a slightly yellow color of the epithelial cells. In my specimens I found in many places a diffuse brownish coloration of the epithelium. This diffuse coloration was in places seen to permeate the whole thickness of the epithelium, in others it was located in the more superficial layers, leaving the deeper lying ones unstained. Even with the highest magnify-

ing power this coloration could not be dissolved into visible particles. It affected alike the epithelial cells, among which there were a great many goblet cells, and the cementing substance between them (See Fig. 14). These brownish parts were separated from each other by absolutely unstained ones, showing that the solution had not penetrated everywhere uniformly. There was, probably, some chemical reason for this behavior, which is the more emphasized by the fact that just those parts of the epithelium which were stained brownish, also, took upon themselves a much darker red color when the section was stained with fuchsin.

Furthermore; there were here and there minutest blackish granules found lying in the cementing substance and some



FIG. 14.

smaller and larger blackish particles adhered to the surface of the epithelium.

The particular appearance of the epithelium, just detailed, is probably the direct result of the application of the argyrol solution which I had made the day before. Since the argyrol is not caustic and causes no eschara, that is, no superficial necrosis of the epithelium, it seems, we are permitted to conclude that it penetrates the epithelium in the manner here observed. It is generally thought that *argentum nitricum* by its caustic action, which almost immediately destroys the cells with which it comes in contact, brings the deeper lying, younger cells and the microbes which they may contain, quickly to the surface and under the more direct influence of medication. This process is enhanced by the stimulating effect produced on the tissues by such an application. On the other hand it has been found that solutions of the organic silver salts which have no caustic action pass farther into the depth of the tissues, that, poetically speaking, they hunt for the microbes in the depth, and in this was seen their especial value.

If my explanation of this diffuse brownish stain of the epithelium in my case as a direct result of the argyrol application is correct, this stain would probably be an evanescent one. It, also, has nothing to do with the previously existing argyrosis of the conjunctiva.

THE PATHOLOGY OF SUPERFICIAL PUNCTATE KERATITIS, WITH REMARKS ON NEUROPATHIC KERATITIS IN GENERAL, AND ON A HITHER-TO UNDESCRIBED LESION OF THE IRIS.

F. H. Verhoeff (*Trans. Am. Oph. Soc.*, 1911) has had an opportunity to examine histologically an eye affected with punctate keratitis, the first, he believes, that is recorded, where the examination was made at a sufficiently early stage to be of much value. From his findings, which he gives in detail, and study of the subject, he concludes:

Superficial punctate keratitis (Fuchs) is a form of neuropathic keratitis.

The corneal lesions in this condition consist of slowly formed necrotic leukocytic infiltrates seated beneath Bowman's membrane, and are due to the action of pyogenic diffusible toxic substances arising at nerve terminals.

Clinical evidence indicates that the casual lesion is in the ciliary ganglion, and that it is probably due to the elective action of a systemic toxin on certain of the ganglion cells therein.

In this affection there sometimes occurs well-marked focal proliferation of the iris bloodvessels. This observation confirms the view that vascular naevi are neuropathic in origin, and suggests that certain angiomas arising later in life may have a similar origin.

Disciform keratitis (Fuchs) is essentially of the same nature as superficial punctate keratitis, and is likewise neuropathic in origin.

Traumatic relapsing keratitis is due to a state of irritability in the peripheral ganglion cells of the corneal nerves, resulting from intense stimulation of the nerve terminals.

MEDICAL SOCIETIES.

OPHTHALMIC SECTION,

ST. LOUIS MEDICAL SOCIETY.

Meeting of January 3, 1912.

Dr. Post in the Chair.

Multiple Gummata at Inner Canthus Simulating Dacryocystitis.

Dr. W. H. Luedde. (Published in full in the AMERICAN JOURNAL OF OPHTHALMOLOGY.)

Mrs. Z., aged 36, had been treated for several weeks by the usual methods without result. An unwarranted incision over the swollen mass at the inner canthus had been made previously at a dispensary, evidently with the hope of reducing the swelling by such drainage. It was ineffective.

Free passage of fluid to the nose on injection into either punctum, the persistence and even increase of the swelling, in spite of free drainage, together with its consistency and location, raised the suspicion of lues in the absence of any history of the disease. Small doses of K. I. proved of no avail. These had been given at the beginning before the luetic nature of the trouble was recognized. Large doses brought about a prompt and complete cure.

Congenital Absence of Both Lower Puncta—Lifelong Dacryocystitis—Apparent Cure from Dacryocystorhinostomy.—Dr. W. H. Luedde. (Abstracted as above.)

Absence of the puncta lacrimali was found recorded but three times. In two of them the lower punctum was missing as in this case.

T. G. (a Greek laborer), aged 23, sustained a perforating injury to his left eye followed by panophthalmitis and enucleation. Smears from the vitreous showed diplococci (probably pneumococci) similar to those present in almost pure culture in the secretion from the lacrimal sac, indicating the probable source of infection. Examination showed the total absence of either

lower punctum and its papilla and canaliculus. The upper puncta seem normal. Double dacryocystitis has existed as long as the patient could remember. A passage in the direction of the normal canal could be probed and washed through to the lower meatus of the nose on each side, but the treatment had to be intermittent and results were unsatisfactory until the direct opening into the lacrimal sac was made from the nose by Dr. Bryan. Good drainage with the cure of the chronic inflammatory process thus secured greatly increases the patient's comfort and safety. Its permanency may be doubted.

Degenerative Changes Following an Embolus in a Branch of the Inferior Temporal Retinal Artery.—Dr. W. H. Luedde.
(Abstract.)

A clinical picture of an obstruction in the retinal artery or any of its branches is strikingly typical. The subsequent changes in the retinal tissues are not such as to greatly modify the ophthalmoscopic appearance, usually involving destruction of the ganglion cells while the outer layers of the retina remain intact. This patient, a young woman 18 years old, suffered from retinal embolism six months ago, was presented to show the secondary changes. When first seen, thirty-six hours after the first symptom of the attack, central vision was no longer impaired, but an absolute scotoma in the form of a sector or quadrant of the upper segment of the field of vision existed which has remained constant. It extends from 25° on the temporal side to 60° on the nasal side of the vertical at its periphery and is 15° across at the apex just above the point of fixation. The location of the embolus could be made out with the ophthalmoscope at the second bifurcation of the inferior temporal artery. The column of blood was broken in the vessel and in all its branches beyond this point. The area of the retina involved was defined by its pallor and oedema. A week later the affected vessels were again filled except the smaller branch at the point of bifurcation, which had supplied the retina immediately below the macula. This latter artery has gradually disappeared until now only a faint blurred trace of its remains, marked by partially absorbed blood-pigment probably the result of secondary hæmorrhages into its adventitia. A few yellowish granules below the macula are the only other phenomena demonstrable which could be ascribed to this accident to the retinal circulation.

An examination into the general condition revealed a mitral stenosis, a condition often producing emboli in the general circulation. Menstruation had begun twelve hours before the attack. The diagnosis of embolus was rendered probable by the sudden onset of complete blindness which in a short time became partial as the plug was pushed toward the periphery, by the general findings, and by the fact that examination of the patient who had previously presented herself for treatment several times, on account of eyestrain, showed no retinal disease.

Following Dr. Luedde's paper, Dr. W. C. Bryan read a paper *On an operation designated by Fuchs as Dacryocystorhinostomy*. This operation was performed by Dr. Bryan on Dr. Luedde's patient and the patient exhibited. The operation consists essentially in making a window from the nasal side directly through to the lowest part of the lacrimal sac without in any way disturbing the dermal surface. This operation is considered as being more satisfactory in its results than extirpation of the sac, although the permanent patulousness of the window is questioned by some ophthalmologists.

DISCUSSION.

Dr. Shahan:—I would like to ask Dr. Bryan if he thinks the method employed would be effective in cases of chronic dacryocystitis in children seven or eight years old.

Dr. Green:—About eighteen months ago a patient entered the City Hospital with an extensive lacerated wound of the lower lid sustained in a drunken brawl. There was an irregular wound which passed through the lower canaliculus and extended 4 cm. down and out on the cheek. After the primary swelling had subsided I sutured the cut edges, obtaining primary union throughout. At the operation I was unable to find the inner cut end of the lower canaliculus, so that when healing was complete there was an annoying epiphora. A probe entered through the upper canaliculus encountered a fibrous band at the entrance to the bony duct. I made an opening in the conjunctiva just at the base of the caruncle, and thence by scissors dissection, worked my way into the sac. Through this opening a silver style corresponding to Bowman 6 was passed into the bony duct and allowed to remain in situ one month. One week after its removal, I was chagrined to find that the artificial opening had closed. As the patient was compelled to remove from the city, I was unable to follow up the case.

I believe that with a large direct opening into the sac (as in the operation performed by Dr. Bryan) an artificial canaliculus would be more likely to remain patulous, and I should be inclined to advise dacryo-cysto-rhinostomy in a case similar to the one cited.

Dr. Bryan:—I cannot speak with any feeling of assurance about children. I do not know that they differ from adults and I should think a well drained sac might even work with them as with older persons. Dr. Green's case might be satisfactorily treated if the drainage could be made as free as it seems to be in the case under consideration.

THE OPHTHALMOLOGICAL SOCIETY OF THE
UNITED KINGDOM.

Thursday, January 25th, 1912.

Mr. J. B. Lawford, President, in the Chair.

It was announced that the Society had accepted the invitation of its Dublin members to hold the May meeting on the 11th of that month in Dublin.

Mr. A. C. Roper showed a case of melanotic sarcoma of the conjunctiva with secondary nodules in the skin. There was no trace of anything in the fundus. He was advised to remove radically the whole of the orbital contents. The skin nodules were found to be malignant.

Mr. G. Coats showed (1) concretions (Drusen) of the papilla; (2) corpora amylacea in the retina.

Mr. Rayner Batten showed a fixation fork, designed for the insertion of sutures in the sclerotic in advancement operations. By its aid one could pick up exactly the amount required, and there was no danger of the needle being pushed in too deeply. He also showed a case of central (macular) coloboma of the choroid of unusual form, symmetrical in the two eyes.

Mr. L. Pisani showed a case, which was originally exhibited in 1880, with peculiar bodies on the iris after needling for lamellar cataract.

Mr. Greeves showed (1) a case of metastatic septic choroido-retinitis, and (2) a case of quinine amblyopia.

Mr. Coats showed a case of tubercle of the choroid in a cat.

Mr. Wray showed a case of glaucoma, a case of keratitis disciformis, and one of exostosis of the roof of the orbit.

Mr. R. R. James showed a case of hyaline degeneration of the disc.

Mr. Horsford showed a case of mal-development of the eyes in a child.

Mr. A. A. Bradburne read a paper entitled "Hereditary Ophthalmoplegia in Five Generations." In this family there was a condition of ptosis accompanied by an almost complete loss of the ocular movements, which had been present in five generations. After enumerating the numbers affected and briefly describing the condition in each he proceeded to consider the various types of this rare affection. He classed anomalies of congenital ocular immobility into three divisions: first and most common, those in which only ptosis was present. Secondly, when this was combined with epicanthus. Thirdly, a type in which ptosis might or might not be present but in which the ocular movements were very defective or altogether wanting. This latter type embraced three sub-divisions: (a) ptosis associated with defect of the superior rectus; (b) more extensive involvement of the eye muscles with or without ptosis, the condition being due to some nerve lesion; (3) this type included the same kind of condition, but was due to entire absence of, or very defective development of the muscles. His own case came under this category. The author pointed out that in two of the younger members a certain return of the movements had occurred, and suggested how this might have come about. He showed that in the shark the ocular muscles arose from three centres: one for the superior obliques, one for the abductors, and the remaining four muscles arose in pairs from a third. These paired muscles were the superior with the internal rectus and the inferior rectus with the inferior oblique. In all the members of this family the superior obliques were probably present, and hence if any further movements became possible one would expect their appearance to follow somewhat the lines as seen in the shark. In one of the members of the family it had done so, as one eye was able to move from a point straight in front outwards, thus seemingly pointing to a development of the second centre. But that did not follow in another case in which both eyes possessed full lateral motion. By analogy one would expect to find development of motion in the upward direction, but such was not present. Hence the human develop-

ment was from a different centre to that of the shark, or another factor was present in the case. As the patient had ptosis, motion in an upward direction would not be of much practical use, hence it seemed as if the visual act had had something to do with the "evolution". This seemed probable as, in the same case, to prevent diplopia, the visual act had produced a convergent squint. Finally, he asked if the argument could be logically reversed and the condition of muscle palsy attributed to a long-continued non-use of the eyes in some ancestor afflicted with ptosis. The paper was discussed by Mr. Bishop Harman, who pointed out that in the sun-fish each of the recti, except the rectus externus, sent off a separate slip which went to the circular fold round the eye, and was capable of retracting a fold from the cornea, and one saw the original development of the levator. The idea of an arrest of development running through a family was easier of acceptance than the more difficult theory which the author had brought forward. Mr. Beaumont (Bath) suggested the condition might not be so much a pathological one as a tendency in this family to a throw-back to a primæval condition antecedent to the development of the oculo-motor muscles.

Mr. George Coats read a paper entitled "On Crystal-like Bodies of radiate structure in the Lens." He said they were found in a hypermature cataract in a woman aged 69, and had not been seen clinically. In the lens nucleus, which had undergone but little degeneration, round and oval bodies, measuring from 0.035 to 0.160 mm. were found. They had a refractile crystalloid appearance, and were marked by numerous fine lines converging towards an axial linear streak or spot. There was frequently a tendency to cleavage along these lines, so that the body was split up into a number of radically disposed pyramidal sectors, not unlike the pyramids of the kidney. In the larger crystals there was a central tuberculated mass of mineral hardness, the structure resembling that of a rubber-cored golf ball. Usually the adjacent lens fibres were arranged round the crystals to form a kind of capsule. Only two similar observations were on record, in one of which the bodies were seen clinically as globular beads with a silky or pearly sheen. In all these cases the lens was cataractous; in two the opacity was senile, in one lamellar, the patient being a child of six. In all, the crystals were confined to the more central layers of the lens. As to the nature of the crystals, the scarcity of material made it impossible to carry out extensive histo-chemical researches, but they

showed considerable structural resemblance to leucin, a diagnosis which was sufficiently probable, since the crystals occurred in cataractous lenses, and leucin is a product of proteid disintegration. They occurred, however, in the least degenerate part of the lens. Hydrochloric acid produced no effervescence. Dr. W. H. Willcox had kindly examined the specimens, and reported that the appearance of the bodies was "similar to that which leucin takes when it has been subjected to dehydrating processes."

The President asked whether Mr. Coats found these bodies in the extracted lens, i.e., whether the eye had been removed. Mr. Burdon-Cooper (Bath) asked if Mr. Coats had ever found tyrosin in the lens. He had himself discovered that substance in the aqueous after needling for lamellar cataract. Professor Halliburton, of King's College, confirmed that it was tyrosin. In wondering how tyrosin could have got there it occurred to him that possibly it was the result of hydrolysis of the lens, and he therefore sent for a pig's eye at the butchers, and found the lens yielded almost pure tyrosin. The microscope gave the most delicate test for it. Tyrosin was fairly soluble in sulphuric acid. He had found the substance in the lens in all cases of cataract, and he was strongly of opinion that the change which took place in senile cataract was hydrolysis of the lens. Mr. Coats, in reply, said there was nothing in his sections which resembled tyrosin.

ABSTRACTS FROM MEDICAL LITERATURE.

By J. F. SHOEMAKER, M.D.,

ST. LOUIS, MO.

EYE COMPLICATIONS ARISING FROM DISEASES OF THE NASAL ACCESSORY SINUSES.

Albert H. Andrews (*Jour. A. M. A.*, August 19, 1911) discusses, among the ocular disturbances which are secondary to diseases of the nasal accessory sinuses, orbital cellulitis and abscess, diseases of the lacrimal apparatus, conjunctival diseases, muscular imbalance, and intra-ocular diseases. He states that of all the causes of orbital cellulitis, accessory sinus disease is without doubt the most common. It may result by extension through the bony walls by necrosis of bone, by the venous chan-

nels, by the lymphatics, and apparently by migration of the infection from one part to another contiguous part. An orbital cellulitis may subside without forming an abscess or an abscess may develop close to the orbital wall and discharge through the sinus from which the infection originated. In the severe forms of orbital phlegmon there is present severe pain, pronounced swelling, chemosis of the conjunctiva, and sometimes cerebral symptoms, as headache, drowsiness, vomiting and disturbance of the pulse and respiration. Vision may be affected by displacement of the eye-ball or by stretching of the optic nerve. Involvement of the optic nerve may destroy the vision entirely. Retinal detachment and panophthalmitis sometimes occurs. The diagnosis of the cellulitis is easy as a rule but the difficulty is often to determine the cause. The ability to correctly diagnose obscure nasal conditions is important; transillumination of the frontal and maxillary sinuses is often of considerable assistance. In the treatment of orbital cellulitis, hot applications to the eye, anodynes when necessary, and such general treatment as may be indicated should be resorted to, and an incision made as soon as pus is detected. Andrews advises not to wait until pus can be detected, but make one or more deep incisions in severe cases, thereby relieving the pressure, and often evacuating pus when it cannot be detected from external signs. In all cases of dacryocystitis, lacrimal abscess or epiphora, he urges the importance of investigating the nose and accessory sinuses as a possible cause. The author thinks that we may safely assume an ætiologic relation between an accessory sinus disease and some cases of conjunctival disease, from the manner in which some of the latter clear up after the sinus trouble is cured. Doubtless in many cases of conjunctivitis the infection has traveled up through the lacrimal apparatus. Esophoria for distant vision with exophoria for near vision is the muscular disturbance most frequently found due to ethmoid disease. This is explained on the hypothesis that an inflammation about the insertion of the rectus internus causes some contraction of this muscle, producing the esophoria for distant vision, while the contractility of the muscle is impaired enough to prevent the eye from being turned inward sufficiently to maintain easy, binocular vision for close objects. The author mentions a number of ways whereby disease in the nasal cavities may affect intra-ocular structures: (1) through the venous channels; (2) through the arterial supply; (3) through the sensory and motor

nerve supply; (4) through the sympathetic nerves; (5) probably by general absorption of infectious material.

A NEW TREATMENT OF ACUTE GONORRHOEAL CONJUNCTIVITIS.

W. Goldzieher (*Wiener Klin. Woch.*, November 23, 1911) has found the application of a jet of steam to the mucous membrane of the everted lids very effective in the destruction of the gonococci. He says the results were quite satisfactory in the fifteen cases he has treated. His method of applying the steam is to hold the nozzle at a distance of three or four cm. from the eye; the temperature of the steam as it comes from the nozzle is 80 degrees C., but becomes reduced to 45 degrees C. by the time it touches the eye, which is not high enough to injure the tissues. While this treatment is not always successful yet the results are much better than those secured with silver nitrate treatment, the nitrate being unable to penetrate the tissues on account of its caustic action producing a barrier beyond which it cannot pass.

TUBERCULIN AS A DIAGNOSTIC AND THERAPEUTIC AGENT IN THE TREATMENT OF CONJUNCTIVITIS ECZEMATOSA (PHLYCTENULAR CONJUNCTIVITIS AND KERATITIS).

BASED ON THE STUDY OF FIFTY CASES.

Richard J. Tivnen (*Jour. A. M. A.*, December 9, 1911) from a study of fifty cases of conjunctivitis eczematosa believes the following conclusions are justified:

1. The tuberculous nature of conjunctivitis eczematosa is established and this opinion is supported by the results obtained in the cases subjected to tuberculin, both diagnostically and therapeutically, and by the majority of the other essential clinical findings.
2. The cutaneous diagnostic tuberculin test of von Pirquet is a dependable method for the recognition of tuberculosis, particularly in children.
3. Tuberculin as a therapeutic agent in the treatment of conjunctivitis eczematosa is an agent of distinct and special value and should be employed faithfully, judiciously and perseveringly in this class of cases.